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WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION,
MORGANTOWN, W. VA.

BULLETIN 83. SEPTEMBER, 1902.

Poultry Experiments.

A comparison of beef scraps, ground fresh meat and bone and milk albumen as sources of protein for laying hens.

Ground grain compared with whole grain, and mash fed in the morning and at night, for laying hens.

An experiment to determine the importance of keeping hens warm at night by means of curtains surrounding their perches.

A trial of the VanDreser method of producing an early and uniform moult.

BY J. H. STEWART AND HORACE ATWOOD.

[The Bulletins and Reports of this Station will be mailed free to any citizen of West Virginia upon written application. Address, Director of Agricultural Experiment Station, Morgantown, W. Va.]

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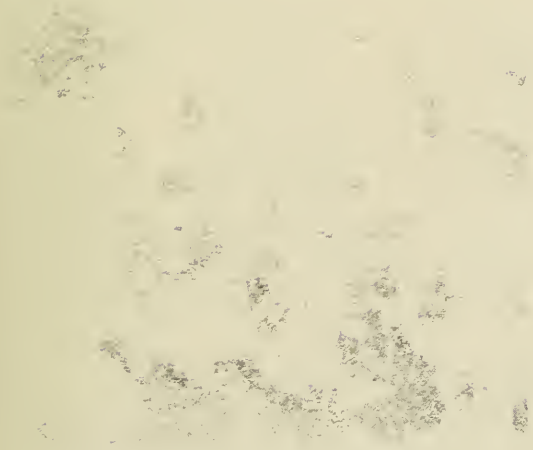


A Comparison of Beef Scraps, Ground Fresh Meat and Bone, and Milk Albumen as Sources of Protein for Laying Hens.

The importance of a narrow or nitrogenous ration for laying hens has been so fully discussed in Bulletin 60 and by the poultry press in general that it is unnecessary to say anything here concerning the necessity of adding to the grain ration a material rich in portein.

The materials most extensively used for this purpose are various preparations made by meat packers, ground fresh meat and bone, and, more recently, materials containing some or all of the solids of skim milk.

The object of this experiment was to study the comparative value of these three classes of materials. High grade beef scraps were obtained from one of the large packing houses in Chicago, and "milk albumen" was supplied by a company which manufactures milk sugar. The fresh meat and bone was obtained from a local butcher and ground as required.

Three pens of fowls were employed in the test, each pen containing ten White Leghorn pullets, ten two-year old hens, and two

cocks. They were fed the same grain ration, and in addition during the first period pen 1 received beef scraps, pen 2 milk albumen, and pen 3 ground fresh meat and bone, while during the second period pen 1 received fresh bone, pen 2 beef scraps, and pen 3 milk albumen. During the experiment an attempt was made to feed as nearly as possible the same amount of protein to each pen.

At no time during the test were the fowls fed heavily for egg production as many of the eggs were used for hatching. This was especially true during the second period, when, in order to secure fertile eggs, very little mash was fed.

The fowls were confined in the houses described in Bulletin 71. One of the runs belonging to each house had been sown to rye in the fall of 1901 and the other runs were sown to oats in the spring, thus providing an abundance of shade and green food. Water, mica crystal grit and granulated bone were supplied ad libitum, and the whole grain which was fed was scattered in the litter in the scratching room. The experiment began November 1, 1901, and was divided into two periods of 120 days each.

The following table shows the average weight of the hens and cocks at the beginning and at the end of the first period:

		Average Wt. at Begin'g		Average Wt. at End	
Pen	How Fed	Hens	Cocks	Hens	Cocks
1	Beef Scraps	3.22	3.75	3.50	4.00
2	Milk Albumen	3.20	4.00	3.50	4.50
3	Fresh Bone	3.22	4.00	3.60	4.50

The table shows that both hens and cocks increased slightly in weight during this period.

The following table shows the amount of food consumed by each pen during the first period, also the number of eggs laid :

	Pen 1	Pen 2	Pen 3
Corn Meal	22.6	23.6	22.6
Wheat Bran	22.6	23.6	22.6
Ground Oats	22.6	23.6	22.6
Oats	80.0	80.0	80.0
Corn	87.0	84.5	83.5
Wheat	190.0	190.0	190.0
Fresh Bone	.....	.....	62.0
Beef Scraps	32.5	.....	.....
Milk Albumen	.....	40.0	.....
No. of Eggs Laid	386.	228.	279.

The table shows that the fowls receiving beef scraps led in egg production during the winter.

The following table shows the cost of the food and other details of the experiment. The prices per hundred weight for food, on which financial calculations are based, are as follows :

	Per Cwt.
Corn and Corn Meal	$ .90
Wheat	1.30
Bran	.90
Oats and Ground Oats	1.10
Beef Scraps	2.10
Fresh Bone	1.00
Milk Albumen	2.50

Table showing cost of food and other details.

	Pen 1	Pen 2	Pen 3
Total Cost of Food	$5.47	$5.79	$5.37
Cost of Food per Fowl per day	.00207	.00219	.00203
Cost of Food per dozen Eggs	.170	.304	.231
No. of Eggs per Hen per day	.161	.095	.116

At one cent per pound the ground fresh meat and bone which was fed to lot 3, cost slightly less than either the beef scraps or the milk albumen. The fowls which received beef scraps, however,

produced eggs at a lower cost per dozen than either of the other lots.

PERIOD 2.

During this period pen 1 received ground fresh meat and bone instead of beef scraps; pen 2, beef scraps instead of milk albumen, and pen 3, milk abumen instead of ground fresh meat and bone.

The following table shows the weight of the hens and cocks at the beginning and end of the second period.

Pen	How Fed	Average Wt. at Begin'g		Average Wt. at End	
		Hens	Cocks	Hens	Cocks
1	Fresh Bone	3.50	4.00	2.85	4.00
2	Beef Scraps	3.50	4.50	2.65	4.25
3	Milk Albumen	3.60	4.50	2.67	4.75

The table shows that all of the hens decreased considerably in weight during this period. On the other hand the average weight of the six cocks was exactly the same at the end as at the beginning of the period.

The following table shows the amount of food consumed by each pen during the second period, and the number of eggs laid:

	Pen 1	Pen 2	Pen 3
Corn Meal	10.0	10.0	10.0
Wheat Bran	10.0	10.0	10.0
Ground Oats	10.0	10.0	10.0
Oats	157.0	158.0	158.6
Corn	106.0	105.0	104.5
Wheat	150.0	150.0	150.0
Fresh Bone	52.0	.....	.....
Beef Scraps	.....	26.0	.....
Milk Albumen	.....	.....	32.0
Number of Eggs Laid	947.	987.	935.

The following table shows the cost of the food and other details.

	Pen 1	Pen 2	Pen 3
Total Cost of Food	$5.44	$5.47	$5.71
Cost of Food per Fowl per day	.00206	.00207	.00216
Cost of Food per dozen Eggs	.068	.066	.073
Number of Eggs per Hen per day	.394	.411	.389

The results obtained during this period agree with those obtained during the first period, since, in both cases, the pen receiving beef scraps led in egg production, followed by the fowls receiving ground fresh meat and bone, while the pen fed milk albumen brings up the rear. It is to be observed, however, that the milk albumen fowls, during the second period, laid, relatively, much better than during the first period, and it is quite possible that with more experience in feeding this material better results could be obtained with it than is shown in this test.

SUMMARY.

In this experiment more eggs were laid by the fowls when fed beef scraps than when they received either ground fresh meat and bone or milk albumen. The health of the fowls remained uniformly good throughout the test, and the low egg yield was due partly to the fact that the houses in which the fowls were kept were not constructed warm enough for economical egg production during the winter, and partially to the fact that the fowls were not fed heavily at any time for egg production as many of the eggs were incubated and strong vigorous chicks were desired.

During the experiment eggs from each pen were incubated and a record kept of the fertility of the eggs and the number of chicks hatched, and although this work will be discussed elsewhere it may be observed here that there was no material difference in the fertility of the eggs.

It is interesting to bring together the results which have been obtained at other stations in comparing the value of beef scraps

and ground fresh meat and bone when used as food for laying hens, and as only a few experiments have been performed along this line, they are reviewed here.

MASSACHUSETTS HATCH REPORT FOR 1895,

pp. 206-208.

In this experiment, consisting of two trials, the value for egg production, of animal meal was compared with cut fresh bone. Light Brahmas and Barred Plymouth Rock hens were employed. The nutritive ratio of the ration was kept substantially the same.

The results are summarized in the following table:

Flesh meal vs. cut bone for hens.

Food	Duration of Experiment. Days	Daily Cost per Fowl	Number of Eggs	Cost per Egg
Meat Meal— first trial	64	.00266	185	.0170
Cut Bone— first trial	64	.00248	163	.0170
Meat Meal— second trial.....	153	.00280	417	.0152
Cut Bone— second trial.....	153	.00300	444	.0143

The results were inconclusive, as in one test the meat meal, and in the other the cut bone, gave the better result, as measured by egg production. The condition of the fowls receiving the meat meal was, however, uniformly better than the cut bone lot.

MASSACHUSETTS HATCH REPORT FOR 1896,

pp. 148-149.

This experiment, which was conducted for 79 days, was made with two lots of fowls, each containing 2 Barred Plymouth Rocks, 15 Light Brahmas, and 2 Wyandotte-Light Brahmas. Both lots were fed the same grain ration. In addition lot 1 received cut bone and lot 2 animal meal. The nutritive ratio of the ration for lot 1

was 1: 4.8 and for lot 2, 1: 4.9. The results of the test are briefly shown below.

Animal meal vs. cut bone for egg production:

	Food Consumed	No. of Eggs produced.	Cost of Food per egg
Lot 1—Cut Bone.....	283.5	269	.012
Lot 2—Animal Meal	287.0	245	.022

In this trial the cut bone gave the better result. No difference was noticed in the health of the two lots of fowls.

MASSACHUSETTS HATCH REPORT FOR 1897,

pp. 41-42.

This test was made with two lots of Barred Plymouth Rock hens. Each lot was fed the same grain ration, and in addition lot 1 was fed Chicago gluten and cut bone, and lot 2 Buffalo gluten and animal meal. The nutritive ratio of the ration for lot 1 was 1: 5.05, and of lot 2, 1: 4.45.

In this test the animal meal gave a better result than the cut bone as regards egg production, but as the nutritive ratios of the two rations differed considerably the results cannot be strictly compared.

WEST VIRGINIA EXPERIMENT STATION.

Bulletin 71; pp 390-392.

In this test two similar lots of Barred Plymouth Rock fowls were used, each lot consisting of 17 hens and one cock. Each lot received the same grain ration, and in addition lot 1 received meat meal, and lot 2 ground fresh meat and bone. The experiment was continued for 120 days.

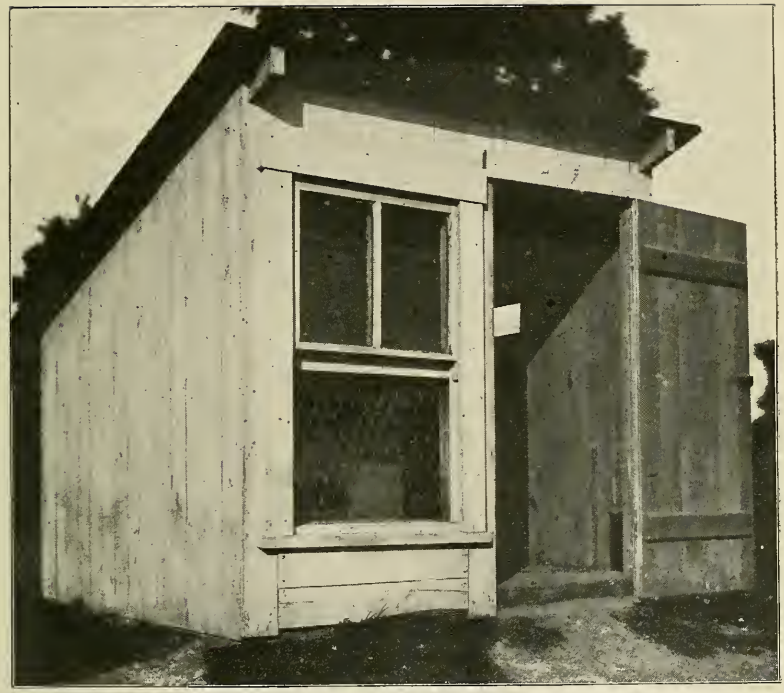
"During the experiment four of the hens receiving meat meal died and were replaced by others. At the time it was thought

that they were killed by some poison present in the meat meal. The fowls receiving ground fresh meat and bone remained healthy during the entire test."

"In this test the fowls fed ground fresh meat and bone laid more and larger eggs, increased more in weight and were healthier during the experiment than the fowls receiving meat meal. Of course with another sample of meat meal the results might have been different, and consumers are advised when purchasing meat meal or beef scraps to insist upon obtaining a perfectly fresh article."

GENERAL SUMMARY.

If we consider the test which is reported in the Massachusetts Hatch Report for 1895 as consisting of two separate trials, then three tests are favorable to meat meal or beef scraps, and three tests are favorable to ground fresh meat and bone, and we may therefore conclude that the dried and ground material, when pure and untainted, is equally as valuable as the ground fresh meat and bone. The beef scraps, further, possess the advantage that a supply sufficient for several months can be obtained at one time, while with fresh meat and bone there is always considerable trouble and expense connected with obtaining the supply regularly and grinding it.



A Colony House.

Ground Grain Compared with Whole Grain, and Mash, Fed in the Morning and at Night, for Laying Hens.

On most poultry farms, it is the custom to feed to laying hens in the morning a mash in which corn meal, ground oats, wheat bran, steamed clover, beef scraps, or other feeding stuff are incorporated in various proportions. Toward evening, whole grain is usually scattered in the litter, and the fowls are thus obliged to scratch vigorously for their evening meal. On the other hand, some poultrymen strongly advocate the practice of feeding the whole grain in the morning and the mash at night, claiming that by so doing the hens are kept busy during the entire day, and that they consequently take more exercise, resulting in an increase in the egg production.

In order to study this question, and to compare the results with those obtained when only whole grain is fed, the experiment described below was performed.

The experiment was begun April 23, 1901, and was divided into two periods of sixty days each. Five pens of fowls were employed. Each of pens 1, 2 and 3 consisted of 20 White Leghorn hens and 2 cocks, nearly one year old at the beginning of the ex-

periment. Pens 4 and 5 contained the same number of White Leghorn hens and cocks about four years old.

The grain ration consisted of corn and oats, ground and unground. Beef scraps were fed dry to those fowls which received the whole grain ration, and in the other cases it was mixed with the mash, which was made by moistening the ground feed and scraps with water at the ordinary temperature. At the beginning of each period the food for each pen was weighed out in bulk and stored in boxes in the scratching sheds. The fowls were fed liberally, and each lot was fed as nearly the same amount of food at each meal as could be done by measure. At the end of each period the food remaining in the boxes was weighed, and thus the total amount of food consumed was determined.

The fowls were supplied at all times with granulated bone, mica crystal grit and water, and each flock was allowed the use of two runs, one of which had been seeded to rye, furnishing shade, and the other sown to oats, thus providing a liberal supply of succulent green food. Each of these runs was fifteen feet wide and one hundred feet long.

All broody hens were removed from the nests at night and the entrances to the nest boxes closed, so that they were obliged to go to roost. The health of the fowls was uniformly good during the entire experiment.

The fowls were kept in the poultry house described in Bulletin 71, the floors of which were kept well littered with oat straw.

PERIOD I.

During this period pen 1 received whole grain scattered in the litter in the morning, and mash at night; pens 2 and 4 were fed mash in the morning and whole grain at night; and pens 3 and 5 were fed entirely upon whole grain.

The following table shows the weight of the fowls at the beginning and end of each period and other details:

Pen	Breed	How Fed	Wt. at Beginni'g	Wt. at End
1	W. L. young fowls	Mash at night	2.98 lbs	2.91 lbs
2	W. L. young fowls	Mash in morning	2.98	2.93
3	W. L. young fowls	Whole Grain	2.98	2.79
4	W. L. old hens	Mash in morning	3.29	3.18
5	W. L. old hens	Whole Grain	3.48	3.14

The table shows that all the fowls decreased slightly in weight during this period.

The amount of food consumed by each lot of fowls during the first period, and the number of eggs laid, is shown below :

Pen	Corn	Oats	Corn Meal	Ground Oats	Beef Scraps	Total Food	Eggs
1	80.	70.25	44.	44.	30.75	269.	617
2	77.5	70.75	45.	45.	31.25	269.5	674
3	125.	116.	.....	.....	31.5	272.5	519
4	80.	71.	45.	45.	33.	274.	580
5	125.	116.5	.....	.....	32.5	274.	560

Comparing the egg production of pens 1, 2 and 3, which were composed of young fowls, it is seen that the largest number of eggs was laid by pen 2, which received the mash in the morning, followed by pen 1 which received mash at night, while far in the rear stands pen 3 which received only whole grain. With the older White Leghorn fowls the favorable influence of the mash is not so noticeable, although still present.

The following table shows the cost of the food and other details of the experiment. For the prices per hundred weight, on which financial calculations are based, see page 445 of this bulletin:

	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5
Total cost of food	$3.02	3.03	3.06	3.09	3.09
Food cost per fowl per day	.00228	.00229	.00231	.00234	.00234
Food cost per dozen eggs	.058	.054	.070	.064	.066
No. eggs per hen per day	.514	.561	.432	.483	.466

The table shows that it cost slightly less than one-fourth of a cent per day to feed each fowl during this period; that the food cost of the eggs was about one-half of a cent a piece; and that the hens averaged to lay about one-half of an egg per day.

PERIOD II.

During the second period the manner of feeding each pen was changed. Pen 2 was fed whole grain in the morning and mash at night; pens 3 and 5 received mash in the morning and whole grain at night; and pens 1 and 4 were fed whole grain.

The grain ration consisted of the same materials as in the first period, but as many of the hens were inclined to be broody they were fed much less liberally.

The following table shows the average weight of the fowls at the beginning and end of the second period and other details:

Pen	Breed	How Fed	Wt. at Beginni'g	Wt. at End
1	W. L. young fowls	Whole Grain	2.91 lbs	3.07 lbs
2	W. L. young fowls	Mash at Night	2.93	2.93
3	W. L. young fowsl	Mash in Morning	2.79	2.93
4	W. L. old hens	Whole Grain	3.18	3.20
5	W. L. old hens	Mash in Morning	3.14	3.29

Although the fowls did not receive so much food as in the preceding period, yet the table shows that all of them, except those

in pen 2, gained slightly in weight. This may have been due to the fact that during this period they did not lay so many eggs as during the first period, and consequently utilized that portion of the food which earlier had been used for the larger egg production for an increase in live weight.

The amount of food consumed, and the number of eggs laid by each flock of fowls, is shown below:

Pen	Corn	Oats	Corn Meal	Ground Oats	Beef Scraps	Total Food	Eggs Laid
1.....	100	93	.....	.....	22	215	487
2.....	69	62	31	31	23	216	549
3.....	69	62	31	31	22	215	485
4.....	100	93	.....	.....	22	215	472
5.....	69	62	31	31	22	215	477

During this period pen 2 which received the mash at night led in egg production. During the first period when this pen was fed mash in the morning it also laid more eggs than either of the other pens of young fowls. From this fact one must naturally conclude that some of the hens in this pen were better layers than those in pens 1 and 3, thus overshadowing the effect of the difference in the manner of feeding.

Comparing the egg production of the pens which received whole grain with those which were fed mash in the morning it is seen that in case of both young and old fowls practically the same number of eggs were laid in each instance, the mash giving a slightly better result with the older fowls, and the whole grain with the younger.

The following table gives the cost of the food consumed by each lot of fowls during this period; the cost of the food for each fowl per day; and the cost of the food per dozen eggs:

	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5
Total cost of food.....	2.38	2.40	2 38	2.38	2.38
Cost offoodp'r fowl p'r d'y	.00180	.00181	.00180	.00180	.00180
Food cost per dozen eggs	.058	.052	.058	.061	.060
No. eggs per hen per day	.405	.457	.404	.393	.397

The eggs produced by the young fowls cost, for food, during this period, a little more than five cents per dozen, and those laid by the old fowls about six cents per dozen.

In order to draw conclusions from this experiment it is necessary to combine the results obtained during the two separate periods. The following table shows the number of eggs laid when the fowls were fed mash at night; mash in the morning, and whole grain:

YOUNG FOWLS.

Whole Grain in morning Mash at Night	Mash in Morning Whole Grain at Night	Whole Grain
Pen 1, period 1, 617 eggs	Pen 2, period 1, 674 eggs	Pen 3, period 1, 519 eggs
Pen 2, period 2, 549 "	Pen 2, period 2, 485 "	Pen 1, period 2, 487 "
Total..... 1166 "	Total..... 1159 "	Total .....1006 "

OLD FOWLS.

Mash in the Morning Whole Grain at Night	Whole Grain
Pen 4, period 1..... 580 eggs	Pen 5, period 1. ..... 560 eggs
Pen 5, period 2..... 477 "	Pen 4, period 2 ..... 472 "
Total ..... 1057 "	Total ....1032 "

Pens 1 and 2 when fed mash at night laid 1166 eggs; pens 2 and 3 when fed mash in the morning laid 1159 eggs; and pens 3 and 1 when receiving whole grain laid only 1006 eggs. The old fowls when receiving mash laid 1057 eggs, and when fed whole grain laid 1032 eggs.

CONCLUSIONS.

1. In this experiment the egg production was practically the same when the mash was fed in the morning as when fed at night.

2. With both young and old fowls better results were obtained when about one-third of the grain ration was fed ground and moistened than when all of the grain was fed whole and scattered in the litter.

3. During the test the average food-cost of the eggs laid by the young fowls was 5.8 cents per dozen, while with the older hens

the cost was 6.3 cents. In this connection it should be remembered, however, that these fowls had a very restricted range, and that all of the food that they received was charged to them at full market rates. On the other hand, on the ordinary farm, where the fowls have unrestricted range, much of their food consists of bugs and worms and grain which is scattered here and there and which otherwise would go to waste. Under these latter conditions the real cost of the food would be only a fraction of that stated above.

It is interesting to review the experiments which have been performed at other stations in feeding whole and ground grain, and mash in the morning or at night to laying hens, and as the results of only a very few experiments have been published they discussed here briefly.

New York State Station, Bul. No. 90, n. ser., May, 1895.— In this trial four lots of pullets were used, two of White Leghorns and two of Buff Cochins. For convenience they are referred to as pens 1, 2, 3, and 4. Pens 1 and 2 were Leghorns and pens 3 and 4 were Cochins. Pens 1 and 3 were given for morning feed each day a mixture of ground grain moistened. Of this mash all was offered that was readily eaten. Later in the day some kind of whole grain was scattered in clean straw. Pens 2 and 4 were fed whole grain, the corn being cracked. This also was scattered in the straw.

The experiment was continued for nearly a year and the following conclusions were arrived at:

1. Two lots of laying hens, of large and small breeds respectively, having their grain food only dry and whole, ate more food at greater cost per fowl and for the live weight than did two similar lots having about 37 per cent. of their grain ground and moistened.

2. A pen of Leghorns, which had for the year 37 per cent. of their food ground and moistened grain, produced eggs at a greater profit than an exactly similar pen fed whole grain.

3. Of two like pens of Cochins, the one fed whole grain pro-

duced eggs at much less cost than did a pen having ground grain, which result is attributed partly to the exercise assured in feeding whole grain.

New York State Station. Bul No. 106, n. ser Aug., 1896. This experiment was practically a duplicate of that reported in Bulletin 90, except that two year old hens were used instead of pullets. The principal conclusions derived from this experiment which was conducted for one year are as follows:

1. Two pens of laying hens, one of large and the other of a small breed, having a ration of grain which was whole, ate during their second year somewhat more food at a little greater cost than two similar pens having a ration in which half the grain was ground and moistened.

2. Cochin hens having a whole grain ration laid much better than than those having the ground grain, although neither lot laid at a profitable rate during the second year.

3. Leghorn hens having a ration in which the grain was whole consumed on the average for two years over 20 per cent. more food for the same egg production than did similar hens having half their grain ration ground and moistened.

Thirteenth Annual Report of the Hatch Experiment Station, pp. 123–129.—Here is reported an experiment having for its object the determination of the relative merits of feeding a mash in the morning as compared with the system of giving it late in the afternoon. The experiment was continued for nearly a year with two lots of fowls each composed of twenty Barred Plymouth Rock pullets. The mash used was commonly mixed with boiling water about twelve hours before use. The morning mash was always given as soon after light as possible, the evening mash just before dark. The whole grain given to both lots of fowls was scattered in the straw in the scratching shed, for the fowls in one coop early in the morning, for those in the other coop about an hour before dark.

The experiment was divided into two portions, a winter and a summer test. During the winter test the hens having the morn-

ing morning mash laid 793 eggs while those receiving the evening mash laid 758 eggs. During the summer test the hens having the morning mash laid 583 eggs, while those receiving the evening mash laid 570. It will be seen that neither in the winter nor summer experiment was there any very considerable difference in the number of eggs produced.

The most striking result of the experiment was the difference in the relative amounts of droppings voided during the night by the fowls under the two systems of feeding, the fowls receiving the evening mash voiding much the larger quantity, which furnishes conclusive evidence that the digestive process in the case of a soft food like mash is very rapid.

GENERAL CONCLUSIONS.

For egg production with the lighter breeds of fowls the evidence shows that it is good practice to feed from one-third to one-half of the grain ration ground and moistened, while with the heavier breeds, especially when closely confined, whole grain scattered in the litter gives better results.

2. The experiment at this Station, and the one at the Hatch Station, both indicate that it is immaterial whether the mash is fed in the morning or at night.

An Experiment to Determine the Importance of Keeping Hens Warm During the Night by Means of Curtains Surrounding Their Perches.

The importance of keeping laying hens in warm houses during the winter has already been discussed in Bulletin 71, of this Station, where it was shown that the temperature at which the hens are kept is an important factor in egg production during the cold season.

During the winter of 1900–1901 an experiment was performed to see whether curtains which can be let down on cold nights so as to completely inclose the perches would not be just as advantageous as a warm construction of the entire house. The great advantage of the curtain method being that they can be put up for a fraction of what it would cost to construct a thoroughly warm house.

Two of the houses described and illustrated in Bulletin 71 were used in this test. The perches are merely strips of inch boards placed ten inches above the droppings board, which is three feet wide and six feet long. In one of these houses burlap curtains were suspended from the ceiling so as to shut in the perches

on all sides when let down, a small opening being left in one corner for the entrance and exit of the fowls. The space thus shut in had a content of sixty-three cubic feet.

Forty White Leghorn pullets and four cockerels were divided into two uniform lots and placed in the houses prepared for them. The experiment began November 14, 1900, and continued for four periods of thirty days each. The food for each period was placed in suitable covered boxes situated in the scratching sheds. At the end of each period the food remaining in the boxes was weighed and thus the exact amount of food consumed was determined. The fowls had access at all times to granulated bone, mica crystal grit and water, and were allowed runs fifteen feet wide and one hundred feet long which had been sown to rye and crimson clover. A mash of ground feed was fed each morning to which was added a small quantity of beef scraps. At night whole grain was scattered in the litter which covered the floors to the depth of six inches. The droppings were removed regularly each morning from the droppings boards.

As the weather was considerably warmer than usual during this experiment the curtains were lowered so as to shut in the roosting place only during the coldest nights of the test, the plan being to let them down only when the temperature in the houses would fall nearly to the freezing point.

The following tables show the weight of the fowls, the amount of food consumed, and the number of eggs laid.

Table showing the average weight of the fowls:

	Period 1	Period 2	Period 3	Period 4
With Curtains	2.72	2.93	3.18	3.20
Without Curtains	2.66	2.79	3.09	3.14

The table shows that the fowls protected by the curtains were slightly heavier at the beginning of the experiment and remained slightly heavier than the other lot.

The following table shows the amount of food consumed during the 120 days of the test:

Kind of Food	With Curtains	Without Curtains
Corn	120 lbs	120 lbs
Wheat	124.5	127
Oats	83.	83
Corn meal	27.9	28
Brown middlings	27.9	28
Ground oats	27.9	28
Beef Scraps	23	23

The following table shows the number of eggs produced by each lot during each of the four periods of the test:

Period	With Curtains	Without Curtains
1	43	11
2	49	70
3	94	137
4	148	167
Total	334	358

The prices per hundred weight for feed on which financial calculations are based are shown on page 445 of this bulletin.

The table following shows the cost of the food consumed during the test, and other details:

	With Curtains	Without Curtains
Total cost of food	$4.90	$4.94
Cost of food per fowl per day	.0018	.0018
Cost of food per egg	.014+	.013—
Number of eggs per hen per day	.189	.160

Quite contrary to expectations the fowls not protected by curtains laid more eggs than those enclosed at night. Why this result should have been obtained is not known unless it was because the latter became too warm during the night and thus were rendered more susceptible to colds. In fact several of the fowls in the curtained house had severe colds while the others were free from this trouble. It was thought that possibly the space enclosed

was too small for that number of fowls, and during the winter of 1901-1902 the experiment was repeated with the following result:

Each lot of fowls contained fifteen Barred Plymouth Rock pullets and one cock. The space shut in by the curtains was enlarged so as to contain 90 cubic feet, or about 5½ cubic feet per fowl. The experiment was begun November 1, 1901, and was continued on the same general plan as the preceding test for 120 days. The health of the fowls in both houses remained perfect during the test.

The number of eggs laid by each lot of fowls is shown below:

	Nov.	Dec.	Jan.	Feb.	Total.
With Curtains	39	106	47	52	244
Without Curtains	20	48	64	115	247

The coldest weather of the winter was in December. During that month there were two days when the temperature outside of the houses was below zero, and twenty-two days when the temperature was at least down to freezing. It is to be observed that the egg production of the fowls in the curtained house for this particular month was more than twice as large as in the other case. During January and February, however, the fowls without curtains took the lead so that the total number of eggs laid during the test was practically the same for each lot.

During eighteen days, beginning January 4th, the temperature of the roosting places was taken at night by means of maximum and minimum thermometers. The average of the lowest temperatures for the cold house was 35.5° and within the curtains 41.5°.

The results of both of these tests are unfavorable to the use of curtains in this climate, but according to an unofficial source (Reliable Poultry Journal, Vol. IX pp. 571–573) curtains were used last winter at the Maine Experiment Station with highly gratifying results, and it is quite probable that in a cold climate this method will be entirely satisfactory.

A Trial of the VanDreser Method of Producing an Early and Uniform Moult.

When a specialty is made of producing winter eggs it is of much importance to have the hens shed their feathers early in the fall so that the new plumage may be grown be grown before cold weather begins. In case moulting is much delayed the production of the new coat of feathers in cold weather is such a drain on the vitality of the fowls that few if any eggs are produced until spring, while if the moult takes place early in the season the fowls begin winter in good condition and with proper housing and feeding may be made to lay during the entire winter.

A few years ago Mr. Henry VanDreser proposed a way whereby fowls may be caused to moult as early in the fall as is desirable. Briefly this method consists in withholding food either wholly or in part for a few days, which stops egg production and reduces the weight of the fowls, and then feeding heavily on a ration suitable for the formation of the feathers and the general building up of the system.

The experiment designed to study this method was begun August 5, 1902, with two pens of Rhode Island Reds, and two pens of White Leghorns, about two years old. One pen each of Rhode Island Reds and White Leghorns received no food for thirteen days except what they could pick up in their runs which had been sown to oats in the spring. These runs were fifteen feet wide

Droppings Boards. Fowls fed continuously.

Droppings Boards. Fowls fed according to the Van Dreser method.

and one hundred feet long and nearly all of the oats had been picked from the heads before the beginning of the experiment. The other two lots of fowls were fed as usual on mash, beef scraps, corn, wheat, and oats. After the expiration of the thirteen days all four lots of fowls were fed liberally. Each lot of fowls contained twenty hens and two cocks.

The following table shows the number of eggs produced during the first thirty days after the beginning of the test:

Lot.	ree .	How Fed.	Eggs Produced.
1.....	Rhode Island Reds	Fed continuously	75
2.....	Rhode Island Reds	No food	17
3.....	White Leghorns	Fed continuously	172
4	White Leghorns	No food	25

Lots two and four ceased laying entirely on the seventh day of the test.

Thirty days after the test began the "no food" pen of Rhode Island Reds had practically a complete coat of new feathers, had begun to lay, and within a week from that time one-half of the hens were laying regularly, while the other lot of Rhode Island Reds were just beginning to moult, and the egg production had dropped down to two or three eggs per day. Both lots of White Leghorns were a trifle slower in moulting than the Rhode Island Reds, but otherwise the treatment affected them in a similar way.

For ten days beginning August 19, the droppings boards in the two White Leghorn houses were not cleaned. At the expiration of this time photographs were taken and the plates show the great accumulation of feathers from the "no food" lot of fowls, and the relatively small amount of feathers which had been shed by the other lot

SUMMARY.

Mature hens, which are fed very sparingly for about two weeks and then receive a rich nitrogenous ration, moult more rapidly and with more uniformity, and enter the cold weather of winter in better condition than similar fowls fed continually during the moulting period on an egg producing ration.